Questions

- Past effects of science on standards

- Future issues

- Increasing flexibility

- New science needs

Past Effects of Science on Standards

- Abundance data led to ESA listings
  - Changed important fish
  - Striped bass/salmon to delta smelt/listed races
- Abundance/X2 relationships
  - Basis for X2 standard
- Harvest information
  - Lower harvest of winter run

Past Effects of Science on Standards, continued

- Direct mortality from salvage and JPE
  - Population effect basis for winter run
- "Entrapment Zone"
  - Not linked strongly to outflow
- Shallow water habitat
  - Aliens, Whoops!
- Splittail and flooded vegetation

Past Effects of Science on Standards, continued

- "Zone of Influence"
  - Smaller that thought
- Alien species, plants and animals
- Others

Key Science/Standard Issues for Future

- Real time estimates of population level effects of Delta water project operations

- Developing ways of comparing actions affecting fish

- Improving understanding of hydrodynamics and fish movement in Delta

- Contaminant, predation, and food effects on fish

- Habitat for smelt

Increasing Flexibility

- X2
  - Predict X2-controlling periods
  - Use abundance relationships to estimate effect of strict compliance
  - Also estimate effects of relaxations
  - Carry along uncertainties
  - Estimate water supply & EWA effects
  - Estimate other effects

Increasing Flexibility continued

- X2
  - Give agencies with authority the option of how to comply
  - Allocate water to environmental uses (EWA)
  - Possibly some water for ag/urban use

Increasing Flexibility

- Delta smelt
  - Use combination of Kimmerer fractional entrainment mortality and Herbold "concern quantification"
  - Use particle tracking model for near term predictions of entrainment levels
  - Track (and predict) cumulative fractional entrainment mortality (e.g. winter run)
  - More efficient/frequent sampling
- Consider CFEM in managing export curtailments

Increasing Flexibility

- Salmon
  - Use export-DCC vs. survival regressions to estimate population change at Chipps Island
  - (S2-S1)/S1 = population change
  - Must have data on fish entering Delta or handle parametrically
  - Use population change estimates as one basis for export-DCC decisions

Benefits of Flexibility

- <u>Theoretically</u>

  - Manage based on population effects <u>should</u> produce more benefit for same water

  - Adjusting standards based on real time conditions <u>should</u> produce more benefit for same water

Risks of Flexibility

- Must have ways of ensuring:
  - Environmental benefits
  - Water supply
- Use gaming to check benefits and figure out how to produce assurances
- Use flexibility as an option

Next Step

- Game population-effect-based operation

- Use as an option for agencies with authority

New Science Needs

- Better ways of estimating population level effects
- Better ways of comparing actions
- Finding the "wild cards"